

CLAIMS:

1. A biochip, comprising a substrate defining a plurality of fluid holding areas, there being fluid separating means for preventing mixing of fluids held in said areas until the application of pressure to one or more said fluid.

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2. A biochip according to claim 1, further including means for applying pressure to the one or more fluid.

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3. A biochip according to claim 2, the means for applying pressure comprising at least one expansible element, the arrangement being such that expansion of the or each expansible element results in the application of pressure to the one or more fluid.

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4. A biochip according to claim 3, wherein the expansible element is expansible upon application of light thereto at a suitable wavelength to cause heating of the example element.

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5. A biochip according to any preceding claim, wherein the or each separating element comprises a frangible membrane or film.

6. A biochip according to claim 5, the membrane or film comprising a polymer.

7. A biochip according to claim 6, the polymer comprising nitrocellulose, polyethylene, or polypropylene.

5 8. A biochip according to any of claims 1 to 4, wherein the or each separating element comprises a fluid.

9. A biochip according to claim 8, wherein the fluid comprises mineral oil, vegetable oil, or paraffin.

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10. A biochip according to claim 8, wherein the fluid comprises a metal which is liquid at room temperature.

11. A biochip according to claim 10, wherein the metal comprises  
15 mercury or Gallium.

12. A biochip according to any of claims 3 to 11, wherein the expansible element is a liquid.

20 13. A biochip according to any of claims 3 to 11, wherein the expansible element comprises an aqueous suspension of activated charcoal, a colloidal suspension, glycerol, oil, a gel or a polymer.

14. A biochip according to any preceding claim, further including a micro-organism in one fluid holding area, the micro-organism being in a substantially inactive or dormant condition, and a fluid in a second fluid holding area in fluid communication with the first said area and separated therefrom by a said separating element the fluid being adapted to reactivate the micro-organism.

15. A biochip according to claim 14, wherein the micro-organism is a bacterium.

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16. A biochip according to claim 14, wherein the micro-organism is a fungus.

17. A biochip according to claim 16, wherein the fungus has been bio-engineered to luminesce or fluoresce in the presence of a pre-selected analyte, such that the luminescence or fluorescence output varies in response to the presence or absence of the analyte, the fluid in the second said area comprising the analyte.

18. A biochip according to any of claims 14 to 17, wherein the reactivating fluid comprises or includes water.

19. A biochip according to any of claims 14 to 17, wherein the

reactivating fluid comprises or includes a mixture of water and nutrients required to stimulate activation/germination and growth of the micro-organism.

5           20. A biochip according to any of claims 14 to 19, wherein the micro-organism is disposed in a hydratable matrix.

21. A biochip according to claim 20, the matrix comprising an acrylamide based polymer or hydrogel, or a filter paper.

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22. A biochip according to any of claims 1 to 13, further including a protein or nucleic acid in one fluid holding area, said protein or nucleic acid being in a form requiring activation.

15           23. A biochip according to claim 22, wherein the protein is an enzyme requiring the presence of a co-factor or substrate for activity.

24. A biochip according to any preceding claim, further comprising a cover disposed at its upper (in use) surface, the cover  
20 comprising one or more perforation.

25. A biochip according to claim 24, the cover comprising filter paper.

26. A biochip according to claim 24, the cover comprising a dialysis membrane, or a perforated film.

5 27. A biochip according to claim 24, the cover comprising a self-sealing membrane comprising silicone, latex or rubber.

28. A biochip according to any preceding claim, including a lower (in use) surface comprising of a transparent material.

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29. A biochip according to claim 28, the lower (in use) surface comprising a glass, polycarbonate or polystyrene.

15 30. A biochip according to any preceding claim, wherein the substrate comprises silicon.

31. A biochip according to any preceding claim, comprising three fluid holding areas, a first containing a sample of cells, a second containing a fluorescent dye or probe, and a third containing a fixative, the areas being in  
20 fluid communication and separated from one another by separating elements.

32. A biochip according to any of claims 1 to 29, comprising four fluid holding areas, a first containing a sample of cells, a second containing a

growth medium, a third containing a substrate, fluorescent dye or probe, and a fourth containing an unknown test substance, the areas being in fluid communication and separated from one another by separating elements.

5           33.    A method of fluid transfer in a biochip, comprising the application of light to a portion of the biochip.

          34.    A method according to claim 33, wherein the light is laser light.

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          35.    A method according to claim 33 or claim 34, wherein the light is applied to an expansible element, the light being adapted to cause heating of the expansible element which in turn causes displacement of the liquid.

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          36.    A method according to any of claims 33 to 35, carried out on a biochip as claimed in any of claims 1 to 31.

          37.    A method according to claim 36, including the step of selectively activating fluid holding areas to achieve mixing of fluids.

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          38.    A method according to claim 36, including the step of varying the power of the laser to regulate the volume and/or velocity of fluid transfer.